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## ECONOMIC COOPERATION WITHIN GLOBAL VALUE CHAINS AMONG CEE AND LAC COUNTRIES

### Example of the Volkswagen Group - case study of the Audi Motor Hungaria Kft.

The purpose of this study is to identify the linkages of the economic cooperation between one Central European country and the Latin American countries. We examine the cooperation, taking place in the value chain of the Volkswagen Group. We explore the direct and indirect linkages among the individual production plants, i.e. between Hungary and three Latin American countries Mexico, Brazil and Argentina. This geographical analysis illustrates the core activities of the original equipment manufacturer (OEM<sup>1</sup>) relating to the production. The main goal of our research is to geographically designate the activities, relating to the production in the global value chain and find the linkages among the production places<sup>2</sup>.

### The Volkswagen Group

In 2012 the Volkswagen Group with its production of 9,2 million vehicles<sup>3</sup> is the **third largest automotive company in the world**. The company consists of two divisions (see figure 1.). The financial services division provides the financial background for strong earnings and unit sales for the company. Also the favorable innovative background of the company allows leveraging additional potential along the value chain (Volkswagen 2013, p. 126.). The main scope of the Volkswagen Group is the automotive division. The company is produce twelve brands that is a wide spectrum of supply. There are the passenger car brands: Volkswagen, Audi, SEAT, Škoda, Bentley, Bugatti, Lamborghini and Porsche, and the commercial vehicle category: Volkswagen Commercial Vehicles, Scania and MAN. Besides this the company has **large geographic extension** in the case of markets and production plants as well. Since 1948 when the first export vehicles went to Europe, Volkswagen has been steadily increasing its sales in abroad. In 2012 the Group sells its vehicles in 153 countries, all over the world from Iceland to New-Zeeland. Concerning the geographical distribution of the production Europe still plays a decisive role, there are 37 production plants in 19 European countries. In further eight countries from the North- and South-America, Asia and Africa are total 21 factories (Volkswagen 2013, p. 205.).

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<sup>1</sup> The original equipment manufacturer (OEM), manufactures products or components that are purchased by another company and retailed under that purchasing company's brand name.

<sup>2</sup> This paper was prepared in a research financed by the EULAC Foundation.

<sup>3</sup> Total production of the company is 9,254,742 of which 8,576,964 cars (OICA 2013)

**Figure 1. Divisions of the Volkswagen Group**

<b>Volkswagen Aktiengesellschaft</b>		
Automotive Division		Financial Services Division
Passenger Cars	Commercial Vehicles, Power Engineering	Volkswagen Financial Services
Volkswagen, Audi, SEAT, Škoda Bentley, Bugatti, Lamborghini Porsche, Ducati	Volkswagen commercial Vehicles, Scania MAN	Volkswagen Financial Services AG Europe / Asia-Pacific / North- and South America
		Financial Services USA / Canada / Spain / Argentina
		Scania Financial Services MAN Financial Services Porsche Holding Financial Services Porsche Financial Services
Remaining companies		

Source: Winterkorn 2012, p. 6.

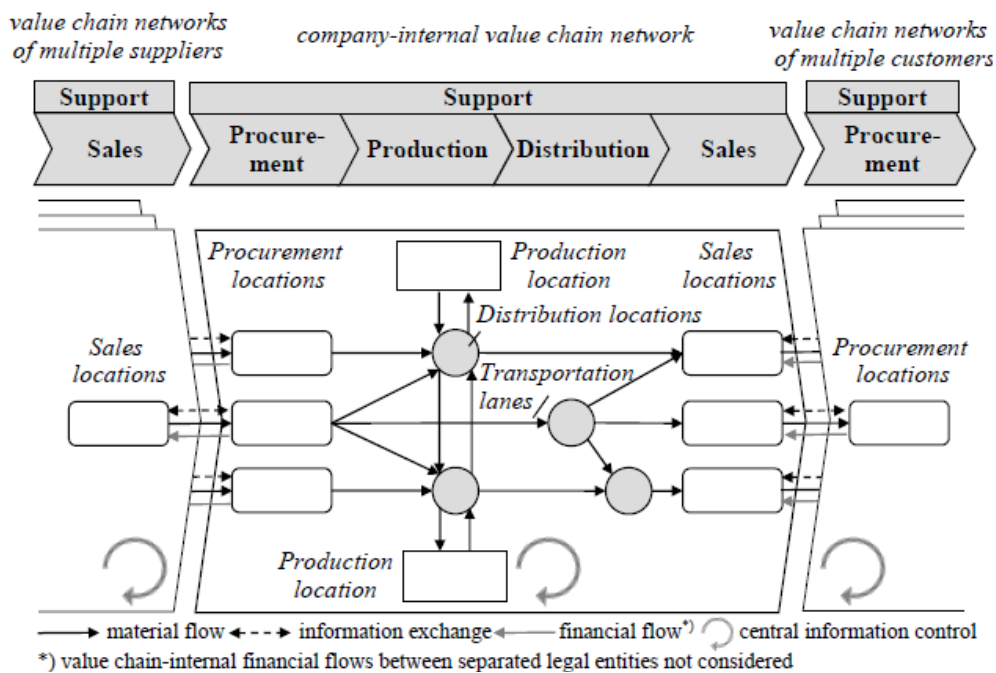
### **The idea of the value chain and internationalization of the firms**

The idea of the value chain was developed by Michael Porter (1985). The aim is the value chain conception is not only modeling the value chain process along the supply chain, but highlighting the organization's competitiveness through every activity. In this context it evaluates the value creating activities that contribute to the production of the organization or the services provided by the organization.

The methodology of this paper is based on Porter's idea. For the analysis of a company's value chain and finding the linkages among the separated production places first we have to separate the value activities in the company. Separation of activities in the value chain is different by various authors. Porter uses the classical functional separation of the activities, distinguishing to primary- and support activities along the supply chain. He specifies five primary activities (inbound logistics, operations, outbound logistics, marketing and sales, service). Schmid and Grosche (2008) separated four variables (procurement, R&D activities, production and sales). Beside the support functions Meyr et al. (2004) and Rohde et al. (2000) specifies also four stages (procurement, production, distribution, sales) at the primary activities. Kaplinsky and Morris (2002) distinguish simple value chains with four stages (design and product development, production, marketing, consumption/recycling) and extended value chains with multiple linkages and value added activities.

Keeping the original divisions mentioned above, Kannegieser (2008) add to the former linear idea an internal network structure. Therefore the value chains include the relationships within the company and with other companies (see figure 2.).

**Figure 2. The value chain network**



Source: Kannegieser, 2008 p. 16.

When introducing the value chain management he defined it as “*integration of strategy, planning and operations decisions in the value chain to reach a global value optimum*” (Kannegieser, 2008 p. 60.). Essentially this means that with value chain planning the firm plans its volumes and values throughout the global value chain network. Spatial scale of the value chain was emerged at other authors as well. Global commodity chains at Gereffi (1999), global value chains/networks at Abonyi (2007). During the analysis of the global apparel value chain Gereffi and Memedovic (2003) in the value chain distinguish raw material networks; component networks; production networks; export networks and marketing networks what organized on globally.

Developments of the value chains were based on global processes, as globalization in the productive sphere implies functional integration between geographically dispersed activities (Gereffi et al. 2001). Thereby companies have to solve this internal integration process in addition to pursue serving the market (i.e. proximity to customers, see: Dunning 1993, 2000), and take into account other internal and external factors as well. The main point of our research is the internationalization and framework of the value chain. Concerning internationalization and building up regional structure of the value chain, Schmid and Grosche (2008) highlight four **external factors** in the automotive industry. The *emergence of new markets* increase the number of the target markets and stimulates the companies to value activities to the new markets. *Overall economic situation* as change of the exchange rate or oil price influences the decision making processes in the case of installing a new factory. *Competition factors* like cost pressure also play an important role, as often an investment realized by the influence of the newly appeared competitors. *Industry-specific requirements* such as introducing of new technologies or new developments may change the existing value chain. Examining the globalization of the automotive industry Sturgeon and Florida (2000), separated four periods as changing motivations over time concerning the internationalization activities of the companies (offshore production, see table 1.).

**Table 1. The changing motivations for offshore production in the automotive industry**

Motivation	Period
Customer proximity	1890-1919
Lower transport costs	1910-1929
Tariff avoidance/trade friction/local content rules	1930s-present
Lower operating costs	1980s-present

Source: Sturgeon-Florida 2000, p. 21.

Beside the external circumstances there are also **internal factors** which influence the geographical distribution of each value creation processes. This study does not discuss the development of the different ideas of the internationalization and foreign direct investment theories (see more: Morgan and Katsikeas 1997 and Dima 2010), we focus on production development within the value chain. Concerning internal factors of the internationalization of the value chain, Schmid (2007) uses an eight-point development scale from the export to the subsidiary and the merger. Similarly to the “establishment chain” by Johanson and Wiedersheim-Paul (1975) the development of operations in the individual countries is expected to have an evolutionary process. The internationalization has four steps: 1.) no regular export activities; 2.) export via independent representatives (agent); 3.) sales via subsidiary; 4.) production/manufacturing. In terms of the formation of linkages in the company’s global value chain the development of local production is a key factor. At the initial stage of development process the local production plant is a net consumer, later operates as a net producer and supply to the other production plants. The Volkswagen plant in Mexico began in the 1970’s with CKD assembly and now exports engines to the Volkswagen’s Chattanooga Assembly Plant in the U.S (Volkswagen 2014).

### **Value chain in the automotive industry**

The size and the geographical spread of the global value chain in the automotive industry – as any other globally operating industry – depend on the internationalization of the company. There is a globalization trend in the automotive industry since the 1980’s when an increasing number of automotive firms began to starting offshore assembly. Not even the share of the foreign sales has been increasing but new production facilities were set up. The boom was from the 1990’s when firms have been opening new plants in the emerging economies in Eastern Europe, India and China (Humphrey and Memedovic 2003). This development has a significant impact on industry structure as well (Sturgeon and Florida 2000). Currently there are automotive companies which have high foreign share compared to total sales. Japanese companies’ (like Honda, Nissan, Isuzu, Mitsubishi and Toyota) foreign sales have higher share, as the Germany manufacturers: Volkswagen, BMW, Daimler and the latest the Korean companies KIA (Schmid and Grosche 2008). Above mentioned market entry strategies (Schmid 2007) and evolutionary idea (Johanson and Wiedersheim-Paul 1975) confirm that evolution of the **firm’s internationalization** results of the development of a global value chain. Cooperation among the OEMs, which providing local presence, such as Volkswagen with Daimler assembling vans and exchanging components (transmission) and platforms, affects the local content in the global value chains. Cooperation between Suzuki and GM-Opel to produce Splash/Agila cars in a same platform also transform both value chains and taking advantage of the opportunities at the synergies<sup>4</sup>. At the beginning of 2013 Toyota Motor Corporation and BMW signed an agreement to tighten technical cooperation to jointly

<sup>4</sup> Car news 6/15/2006 <http://www.autoweek.com/article/20060615/FREE/60614003>

develop lithium-air batteries and new lightweight materials<sup>5</sup>. Deepening the cooperation and synergies cross-ownership is a good example for the alliance between Nissan and Renault, what ensures joint distribution and cooperation to common R&D.

**Outsourcing** also redraws the map of the production. In 2012 Porsche gave the boxer engines production from the Finnish partner Valmet to the Austrian supplier Magna Steyr<sup>6</sup>. Technological cooperation also plays an important role at the allocation of the R&D activities. It does not just mean that after new contracts the value production activities may be allocated to another location, but increasing outsourcing restructures the whole value chain (Sturgeon and Florida 2000). A new trend of the globalization emerged in the U.S. automotive industry beginning of the 1990s. The size of the transformation shows that in the United States between 1990 and 1996 in the automobile industry 103 thousand new jobs were generated, which was realized mostly not at the OEMs but at the suppliers.

Other authors like Sturgeon and Florida (2000) highlighted **globalization** as the engine of the transformation of the industry. Globalization of the firm affects the structure of the industry (production, suppliers, investment) and also the geography of the automotive industry (new emerging markets, expanding free trade agreements).

According the motivation of investments Sturgeon and Florida (2000) set up four hypothetical categories of the locations. The research question was to find out why the automotive companies invest in production facilities outside their home countries. Types of the locations specify the type of the production and scale of activities at the foreign branch<sup>7</sup>. The hypothetical categories are the following (Sturgeon and Florida 2000, p. 12.):

- Type 1.) countries where the firm's headquarters are located: General Motors in the United States, Volkswagen in Germany/Western Europe, Toyota in Japan, Hyundai in South Korea;
- Type 2.) large existing market areas: United States, northern Europe and Japan;
- Type 3.) peripheries of large existing market areas: Mexico, Canada, Spain, Portugal and East Europe;
- Type 4.) big emerging markets: China, India, Vietnam and Brazil;

The main message of this conception is that moving away from the core area (Type 1), output and value added are decreasing. While the level of the local supply or capacity is high at the Type 1 production site, the capacity and local content is low at the Type 4 countries. Since the 2000's when production has been increasing in the newly emerged economies like China or Brazil not only the OEMs, but the suppliers become globally and getting increasing role (Sturgeon and Biesebroeck 2011), but due to mergers and acquisition the size of the OEMs and suppliers has been growing continuously (Dannenberg and Kleinhans 2005).

The other motivation for spreading international production is the **political pressure** from the target country, i.e. increasing market protectionism in order to starting regional/local production (Sturgeon et al. 2008). OECD, UNCTAD and WTO (2013, p. 15.) drew attention to the importance of protectionism along the companies involved in the value chain as it affects the demand, production and investment at all stages of the value chain.

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<sup>5</sup> Automotive News on 1/24/2013 <http://www.autoweek.com/article/20130124/carnews/130129913>

<sup>6</sup> Automotive News Europe on 6/26/2008 <http://www.autoweek.com/article/20080626/FREE/491595533>

<sup>7</sup> Verification of the hypothesis was just partly successful because of the small sample size of the data, so it is need for additional research.

## Geographical distribution of the activities in the Volkswagen Group

Due to the conquest of new markets and cooperation and acquisitions, Volkswagen is a transnational company that involves more resources from abroad than from its home country Germany. Foreign share has grown in the case of sales revenue since 1956, in the case of foreign production since 1993 and in the case of employment abroad since 2008 (Volkswagen 2008). Foreign component in the total activity is often used to measure internationalization level. It refers to **assets**, **sales**, **production**, **employment** or **profits** of foreign branches or affiliates (United Nations 1973, p. 4.). In 1995 the United Nations Conference on Trade and Development (UNCTAD) introduced the index of transnationality (TNI) where transnational companies were ranked by the amount of their foreign activities. The index is counted from the ratio of foreign **assets**, the foreign **sales** and the foreign **employment** as a ratio of the total values (UNCTAD 1995, p. 23.). The TNI index concerning the Volkswagen for the period of 1993-2010 has been growing from 43.3 up to 60.8 percent, what clearly indicates company's globalization.

In recent years, the company continued to increase its foreign exposure (see table 2.), in 2012 foreign shares in the **production was 75 percent**, in the **sales 87 percent** and in the case of the **employees was 56 percent**. The picture is quite asymmetric, what shows that increasing internationalism on the side of the allocation activities in the value chain is rather unequal.

**Table 2. Changes of the foreign exposure of the Volkswagen Group**

	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>Production</b> (thousand unit)	<b>7,358</b>	<b>8,494</b>	<b>9,255</b>
Germany	2,115	2,640	2,321
Abroad	5,243	5,854	6,934
<b>Vehicle sales</b> (thousand unit)	<b>7,278</b>	<b>8,361</b>	<b>9,345</b>
Germany	1,059	1,211	1,207
Abroad	6,219	7,150	8,137
<b>Workforce</b> (yearly average, ths.)	<b>389</b>	<b>454</b>	<b>533</b>
Germany	178	196	237
Abroad	210	258	296

Source: Volkswagen 2013, p. 185.

Regarding the revenues the **automotive division** has decisive role. Passenger car and light commercial vehicles with its 78 percent and division of trucks and buses has 11 percent of all of the revenues has the largest share in the Group. Power engineering has 2 percent and financial services division has 10 percent of all of the revenues.

In order to compare data we take into account the latest available data from 2010<sup>8</sup>. In terms of **sales**, Asia – mostly the Chinese market – has an outstanding role since the early 2000's, however sales revenues in Germany and Europe are still dominant. North- and South American market proved to be stable in the recent years (see table 3.). Apart from maintaining the share on the strategic market Europe and increase sales in East- and South Asia, the main target for the Volkswagen Group is to regain the U. S. market (Browning and Lohscheller 2011). The peak years were at the beginning of the 1970's, when sales in the U.S. market

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<sup>8</sup> From the middle of the 2000's the data for production and for employees is not included in the Volkswagen's annual reports. As a result of detailed research work of the author, data from 2010 are available.

were close to 600 thousands, since then because with turn up new competitors Volkswagen has been losing its market share.

Concerning the **geographic distribution of production places**, most of them are located in Europe and Asia. South America and Mexico also have significant spare capacities. Therefore Asian, South American and European production capacities have key role at the production. There were automobile production plants<sup>9</sup> at the end of 2012 in the following countries: Germany (headquarter), Belgium, Spain, Portugal, Czech Republic, Poland, Hungary, Slovakia Bosnia-Herzegovina and Russia in Europe. There are production facilities in Mexico, USA, North America<sup>10</sup>, Argentina and Brazil in South America. In Africa there are branch in South Africa and in Asia there are affiliates in China and India.

Besides the European production places, Brazilian and Chinese subsidiaries have the largest **output** (see table 3.), where the former branch is export oriented, and the latter despite to the increasing output is dependent on imports<sup>11</sup>. Mexican plants have also remarkable development owing to exports – mainly to the NAFTA region (KPGM 2012) – which has a decisive share. Despite of the competitiveness of the production in Mexico the exchange rate fluctuations of the U.S. dollar cause market disadvantages for the Volkswagen Group. In order to eliminate this in 2008 Volkswagen decided to build a new production facility in the United States (Volkswagen 2009, p. 182.). The Chattanooga assembly plant was began its production in 2011.

**Table 3. Regional distribution of the production, sales and workforce of the Volkswagen Group in the main markets and production places**

(in 2010)

<b>country/region</b>	<b>production units</b>	<b>sales units</b>	<b>workforce person</b>
Germany	2,115,000	1,062,652	178,291
Europe – without Germany	1,824,445	1,864,352	79,270
USA	0	358,500	0
Mexico	434,685	131,000	15,290
Brazil	1,067,105	727,790	26,303
Argentina	87,073	145,800	6,500
South Africa	119,613	72,279	5,634
China	1,692,517	1,924,649	39,980
India	50,019*	53,555	4,459

\* mainly from completely knocked down (CKD) kits

Source: based on the author's compilation of business data and other official/governmental organizations

Based on the balance of the **production** and **sales** there are two types of foreign branches/market. With a surplus of production there are “export producer subsidiaries” as Germany, Mexico, Brazil and South Africa. And where the amount of the import is above the

<sup>9</sup> Except Scania and MAN production plants and Ducati, Lamborghini, Bentley and Porsche plants

<sup>10</sup> Because of close economic and trade relations (NAFTA), Mexico is listed as a North American country in the statistical annexes of the Volkswagen AG.

<sup>11</sup> Based on the balance of the sales figures and production figures in 2010.

gross production there are the “import dependent markets” as Western Europe, the United States, Argentina, China and India.

In 2010, total 388 thousand people worked in the Volkswagen Group, of which 178 thousand employees worked in Germany that is 46 percent of the total **workforce**. Besides this the most workers are employed in the Chinese and Brazilian production places (see table 3.). In the past decade the geographical distribution of the production and sales moving toward globally i.e. the share of the production and sales in Germany has been changing. However the change of the number of the workforce is different from the change of the production. Using *Pearson correlation coefficient* for testing the nexus between the geographical distribution of the production and the workforce, the correlation has been weakening since beginning of the 1980's. In terms of employment the development of the company favored in relative term sustaining the employment in Germany and in Europe.

### **Global value chain of the Volkswagen Group focusing on the relations between Central and Eastern Europe and the Latin American countries**

Volkswagen is a global company, global not just in geographical meaning (horizontally) but its model range (vertically) as well. Production range covers from city car to luxury vehicle, from small commercial van to a heavy commercial vehicle. Volkswagen offers twelve brands, 280 models which produced at 100 production plants (Volkswagen 2013, p. 23.). A company with wide vertical and horizontal extension should seek to coordinate the activities within the company. The inadequate structure of the technology development and production such a multistructure company may cause a significant competitive disadvantage against other competing companies. There were examples in the past such an integrated engine development in the 1970's when the parallel developments at the Volkswagen at the Audi and at the Porsche, were integrated (Tolliday 1995, p. 117.), as a basis of the company's success. It was necessary due to the emergence of new competitors and the declining of the competitiveness in the 1970's. Besides increasing global production, enhancing international competitiveness by competitive internal structure is the main target for the company (Volkswagen 2010, p.198.). Therefore organization structure of the company responds the challenges from inside and outside. Globalization means a structurally step forward after the international production and sales. Thinking global for company means (Eisenberg 2011, p. 10.):

- Global production and platforms;
- Global design – no or minimum local adaptation;
- Global sourcing of local materials;
- Worldwide cooperation with suppliers;
- Flexibility in selection / changes of the production sites.

According to Pries (2003) Volkswagen is a “globally operating transnational company” since the beginning of the 1990's. The concept of Pries (2003) is based on the transformation of the cooperation between the subsidiaries and the parent company. He took into account the spatial configuration of resources, functions, competencies and power between headquarters and plants. In the case of the corporate governance and profit strategies that means that the company after the 1990's follows a *globalised centralism and intra-organizational competition* strategy. In practice that means that carrying out a value activity in an affiliate is not only the question of ability but the question of which subsidiary can make it more cheaper. Assignment of tasks is the result of a competitive bidding within the company (Audi



Hungaria, 2014). Therefore, all analyzes involving the company global value chain is a snapshot only.

Analysing the value chain of the Volkswagen Group, Wiese (2009) highlights the core values of the firm. Based on her concept company basically not focus on low costs, instead of customer nearness what takes the first place, determined the allocation of the activities located in a value chain. This confirmed by the global strategy of the firm what highlights the nearness between the production facilities and the main markets (Isensee 2011, p. 36.).

**Figure 3. An automobile manufacturer's typical production stages**

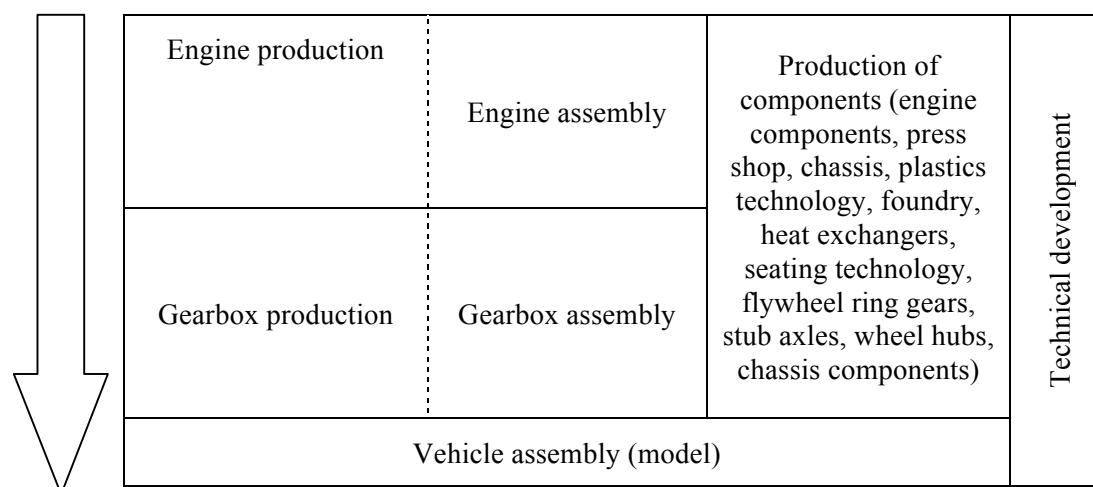
Production of other components			Vehicle assembly
Production of engine components		Engine assembly	
Stamping vehicle body parts	Building vehicle bodies	Painting vehicle bodies	

Source: Schmid and Grosche 2008, p. 20.

To analyze the value chain of the Volkswagen Group, Wiese (2009) – based her examination on Porter's idea – investigated five "chain": operations and marketing as primary activities technology development, human resource management and procurement as supporting activities. There are also other separations of activities in the value chain previously mentioned. This study is based on idea of Schmid and Grosche (2008), the value function of production in the automotive industry (see figure 3.). In the automotive industry it is not necessary for the whole production to be presented in one site, separation of the production stages can be observed at global level.

In order to analyze the source of the data were applied company reports and company interview. According to data from production sites the Volkswagen separates seven different activities in the value chain (see figure 4.).

**Figure 4. Value chain relates to automobile production in the Volkswagen Group**



Source: author

## Cooperation between Hungary and the Latin American countries in the global value chain of the Volkswagen – case study of the Audi Hungaria Motor Kft.

The Audi Hungaria Motor Kft. (hereinafter: Audi Hungaria) based in Győr in Western Hungary, develops and manufactures engines for Audi AG and worldwide locations of the Volkswagen Group and for other “third” partners<sup>12</sup>. There is also a car assembly activity in cooperation with the Ingolstadt factory of the Audi AG. Since its founding in 1993, Audi AG invested total 5.7 billion Euros in Hungary. Today Audi Hungaria is one of the biggest exporter and leading automotive company in Hungary. Due to continuous investments of the Audi AG activities has been expanding. Car assembly started in 1998, motor development center was opened in 2001. Audi Hungaria produced total 1,915,567 engines and 33,553 vehicles and employed 8,663 workers in 2012.

Audi AG has no other production facilities/affiliates in the CEE and LAC region, but as a part of the Volkswagen Group it has several partner locations worldwide, with that the company has direct and indirect linkages. The whole structure as the decision-making mechanism of the company is highly centralized by the Audi AG in Ingolstadt. The company has broad relationships in the western Hungarian region, the company gives work for tens of thousands of people through its suppliers. The main suppliers are component suppliers and other maintenance services. The company has good relations with the local- and state authorities and politics. Audi Hungaria has also cooperation with the higher education. In 2007 the Audi Hungaria Vehicle Engineering Department Group was launched as a part of the Department of Applied Mechanics at the Széchenyi István University in Győr.

Volkswagen Hungaria had linkages to all Latin American Volkswagen subsidiaries. Table 4. shows the value chain related to the automobile production. All activities and production stages are presented in Mexico, in Brazil and Argentina. In the Hungarian branch the production specialized for engine production and vehicle assembly beside to the technical development. We will see that despite of the extensive range of activities there are linkages between the production plants.

**Table 4. Value chain configuration in the examined Volkswagen subsidiaries**

Subsidiary	Country/city	Manufacturing of engines	Manufacturing of gearboxes	Manufacturing of components	Vehicle assembly	Technical development
<b>AUDI Hungaria</b>	<b>Hungary/ Győr</b>	●			●	●
<b>Volkswagen de México</b>	<b>Mexico/ Puebla</b>	●		●	●	●
	<b>Mexico/ Silao</b>	●				
<b>Volkswagen Argentina</b>	<b>Argentina/ Cordoba</b>		●			
	<b>Argentina/ Pacheco</b>	●			●	
<b>Volkswagen do Brasil</b>	<b>Brazil/ Anchieta</b>	●	●	●	●	●

<sup>12</sup> Companies not belonging to the Volkswagen Group

	<b>Brazil/</b> Curitiba				●	
	<b>Brazil/</b> São Carlos	●				
	<b>Brazil/</b> Taubaté				●	

**Abbreviations:**

Audi Hungaria: AUDI Hungaria Motor Kft.

Volkswagen de México: Volkswagen de México, S.A. de C.V.

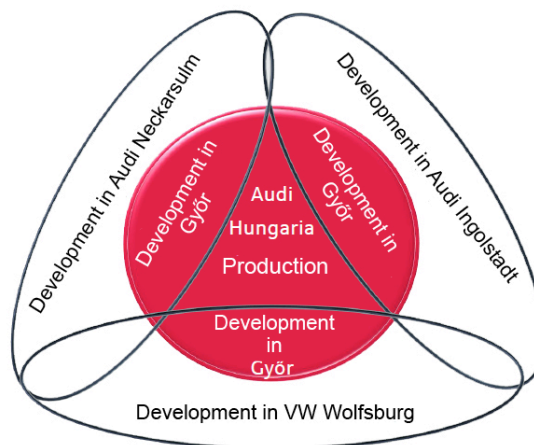
Volkswagen Argentina: Volkswagen Argentina S.A.

Volkswagen do Brasil: Volkswagen do Brasil Indústria de Veículos Automotores Ltda.

Source: Volkswagen (2013): Navigator 2013 - Facts and Figures - Volkswagen Group, Volkswagen Aktiengesellschaft Wolfsburg and company reports

Concerning **linkages** in the value chain and among the production places, there are two types of cooperation: **joint technological development** and **intra-firm trade**. In collaboration of **technology development**, there are joint engine developments managed by the Audi AG (Audi Hungaria 2014). All developments are coordinated by the Volkswagen Group. Concerning R&D there are no duplications, development flow parallel and improvements are based on partial results (see figure 5.). Engines are developed in Győr for Audi, Volkswagen and Porsche models as well.

**Figure 5. Linkages of the technological development running at the Audi Hungaria**



Source: Demmelbauer-Ebner 2012. p.21.

In 1993 when the Audi AG came to Hungary, it was one of the biggest “pioneering” investment same as in 1953 in Brazil, and in 1964 in Mexico. The subsequent period has been showing that these markets and production places (both the CEE and the LAC) are key factors for the global competitiveness of the company. Today the company’s locations can cooperate in research and development at global level (Demmelbauer and Ebner 2012). Although technological cooperation (R&D activities) indirect – developments flow parallel between each site – they **strengthen each other** (Audi Hungaria 2014).

The revenue (engines and vehicles) of the Audi Hungaria is predominantly derived from subsidiaries of the Volkswagen Group. The individual subsidiaries are customers for Audi Hungaria. The main partner for Audi Hungaria is Audi AG, but other Volkswagen Group subsidiaries are also decisive. Large part of the international trade is done through the parent company (Audi AG) and the Volkswagen AG. Concerning “direct linkages” the main trade partner from the LAC countries is the *Volkswagen de Mexico* factory in Puebla (see table 5.). In the last ten years the other LAC subsidiaries *Volkswagen do Brasil* and *Volkswagen Argentina* were among the export partners but this type of cooperation was only temporary. In the case of the trade development between the Mexican and the Hungarian branch 2003 was a changing year when export sales increased by 28 times. The increase of the trade may cause several factors. The year of 2003 was a model change in the Mexican factory. Production of the Volkswagen Beetle (Type1) ceased, new import cars and new types have been introduced in the following years (Volkswagen de Mexico 2014). Modernization of the production range and the technological content needed more engines in Mexico. The Mexican production plant has a key role in the increasing export to the U.S. market in the 1990’s and export to the global market from the 2000’s (Lindner 2010). Other side of the story, that engine was available in Győr so the Hungarian subsidiary could serve the needs of the other foreign branches. The third factor the bilateral agreement and trade liberalization between the EU countries and Mexico from January 1, 2003<sup>13</sup>. Although in 2003 Hungary was not an EU member but the Audi Hungarian had a special “free zone” status, so it could operate as an EU/German factory.

**Table 5. Exports revenues of the Audi Hungaria from the related LAC subsidiaries**  
(1,000 Euros)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Volkswagen de México, S.A. de C.V.	899	1,575	44,740	27,098	51,133	63,164	67,267	83,761	38,316	42,440	42,907	74,620
Volkswagen do Brasil	5	747	264	7	4	2	-	-	-	-	-	-
Volkswagen Argentina	-	-	-	-	107	-	-	-	-	-	-	-
<b>Total</b>	3,461,780	3,487,579	3,632,778	3,829,607	4,137,559	4,921,497	5,775,614	5,534,080	3,844,912	4,741,444	5,509,078	5,203,712

Source: relevant issues of the “Audi Hungaria Motor Kft. Kiegészítő melléklet”

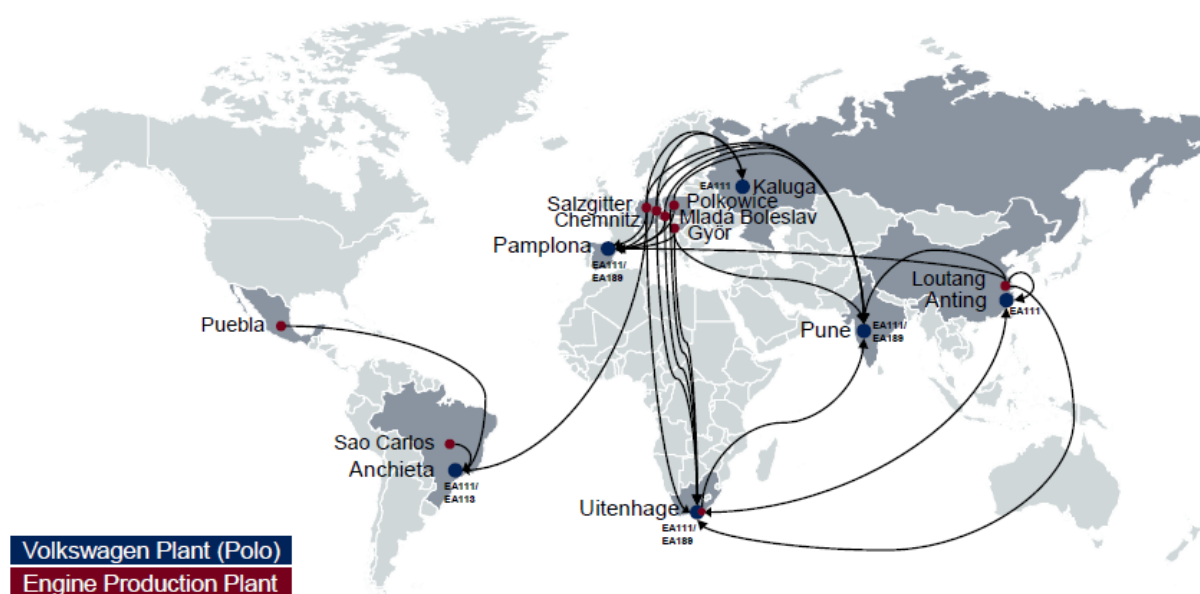
Beside to the Hungarian export to Puebla, Volkswagen de Mexico delivers semi finished engines to Győr. The relationships also exist in the field of the research and development, what is leaded by Audi AG under the coordination of the Volkswagen Group (Audi Hungaria 2014).

**Mapping of cooperation in the value chain** is complex. We examined the cooperation in the value chain concerning engine production and vehicle assembly. There are semi finished engines from Mexico to Hungary and there are finished engines directly to Mexico, and

<sup>13</sup> [http://eeas.europa.eu/delegations/mexico/eu\\_mexico/trade\\_relation/free\\_trade/contents/index\\_en.htm](http://eeas.europa.eu/delegations/mexico/eu_mexico/trade_relation/free_trade/contents/index_en.htm)

indirectly to other costumers. Audi Hungaria delivers 240 engine types into 26 locations worldwide directly. After delivering engines to Audi AG the second biggest customer is the Volkswagen AG. Through the parent company there are linkages to other subsidiaries that are not listed in the annual reports (see figure 6.). Based on the analysis of the relationships, linkages depend on the current model or model range, capacity of the production plant as internal factors. Multi supplier linkages to a certain production site point to the next factor. Opening a new production site or starting an engine production in a new place may come from limits on capacity expansion of the existing sites (Audi Hungaria 2014). Also cost efficiencies calculations relating to the production plants is an important factor. Assignment of tasks is the result of a competitive bidding within the company (Audi Hungaria 2014).

**Figure 6. An example for complexity of the global value chain: the EA111<sup>14</sup> motor delivering/production matrix for assembly of Volkswagen Polo**



Source: Eisenberg 2011 p. 13.

## Main findings

Volkswagen is a global company with many brands, wide model range and global production network. Numbers of the production places are increasing mainly in the South- and East Asian Region, expanding capacity in the existing production places. The differences in the geographical location of the supply (production) and the demand (market) side require a global distributor network. The company aims to reduce production cost and therefore tries to assemble vehicles close to the market. Main target of the company is the “customer nearness” (costumer proximity) meaning not only sufficient supply but the geographical distance between the production places and the target markets. The whole production chain is not definitely presented in each individual production places but in various different countries (Schmid and Grosche 2008), therefore network of the production among the production places is part of the global value chain. There are linkages between the production places as before

<sup>14</sup> The EA111 series is an internal combustion engine series, was introduced in the middle of the 1970s in the Audi.

mentioned. Based on the analysis of the Audi Hungaria, the following conclusions can be made regarding the strengths of the linkages:

- **Trade tariff** especially tax on imports is one of the main factors to influence intra-firm trade, as we saw in the relationship between the Volkswagen de Mexico and Audi Hungaria.
- By increasing the local content besides to decrease export content, **national regulations** has a decisive role from the 1960's. National regulations in the 1960's in Brazil and in Mexico established a minimum proportion of national inputs and a limit of the foreign property in auto part manufacturers (Colistete 2010; Fernández 2005).
- The **type of the vehicle**, in particular the technological content, and **size of production/output** influence the import content in the production.
- The **position of the production place** among the rank of the production facilities and the position in the global value chain is based on **cost-effectiveness calculations**. The position is constantly monitored by internal benchmarks.
- The **scale of the local content** (i.e. number of the locally presented production stages) compared to the **cost of the trade** (i.e. trade of parts, CKD parts, semi-finished products or components) is based on **calculations of the revenues vs. costs**.
- The **position and the role in the value chain** are depending on the **current model range** of the Volkswagen Group. In the case of a model change the role of the production plants may change.
- **Introducing new technologies** or **changing work processes** in the organization (platform, modular or MQB<sup>15</sup>) also may cause a change in the global value chain.

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<sup>15</sup> Modularer Querbaukasten (MQB) the “Modular Transversal Toolkit” platform is the strategy of the Volkswagen Group for shared modular construction of its transverse, front-engine and front-wheel drive automobiles.

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